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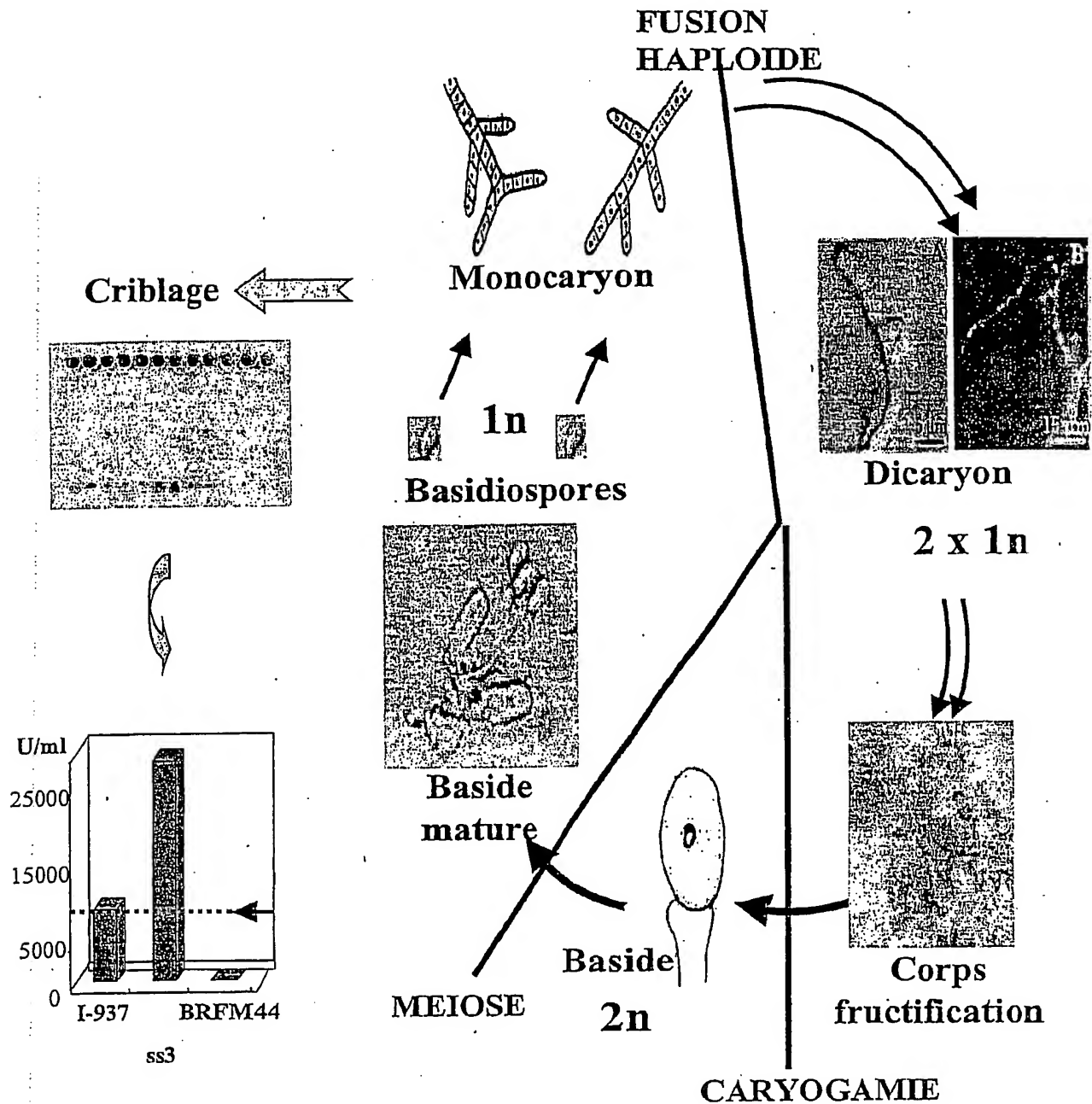


Figure 1 : Isolement de souche monokaryotique déficiente pour l'activité laccase

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2/13

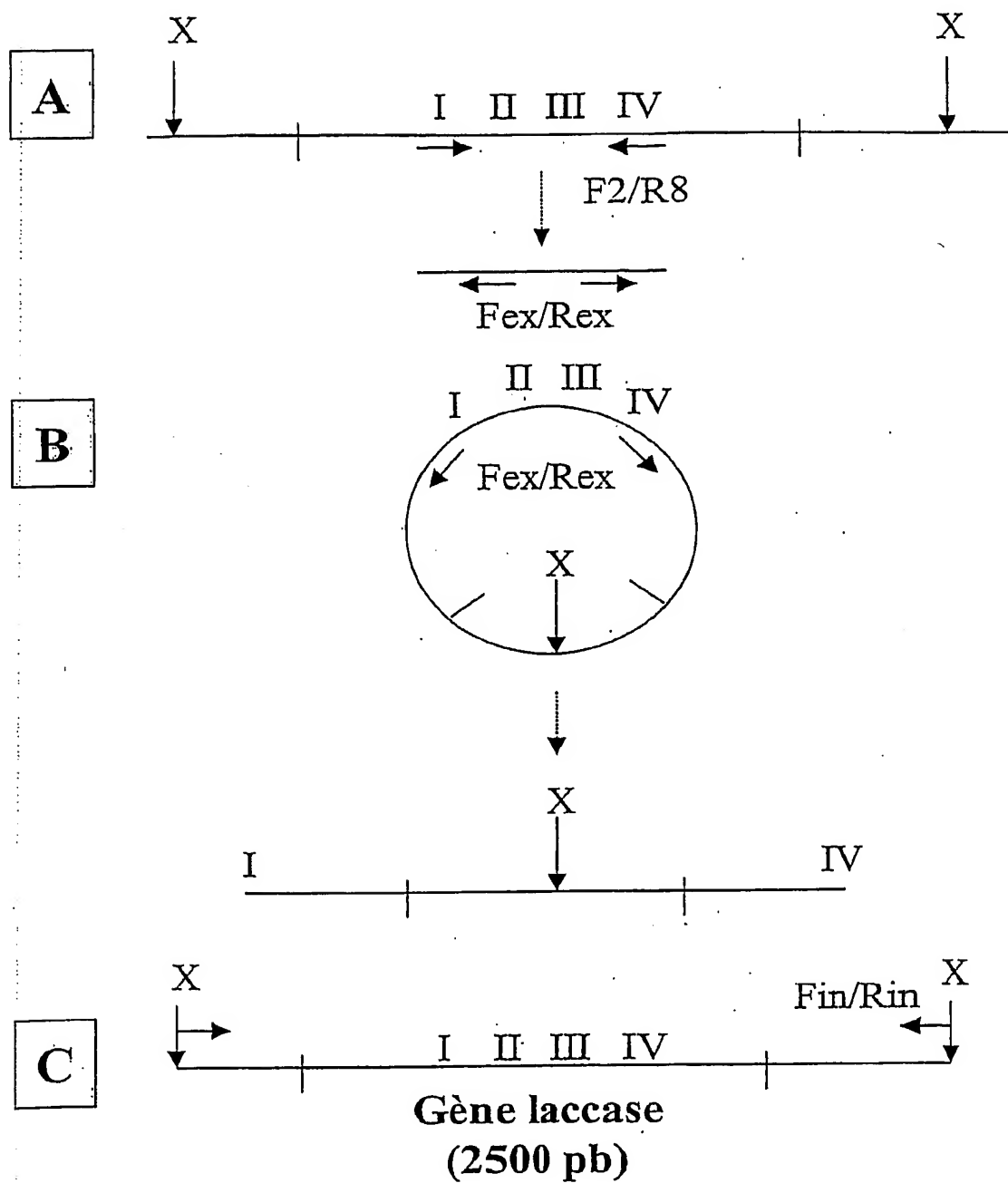


Figure 2 : Isolement du gène codant pour la laccase de *Pycnoporus cinnabarinus* laccase

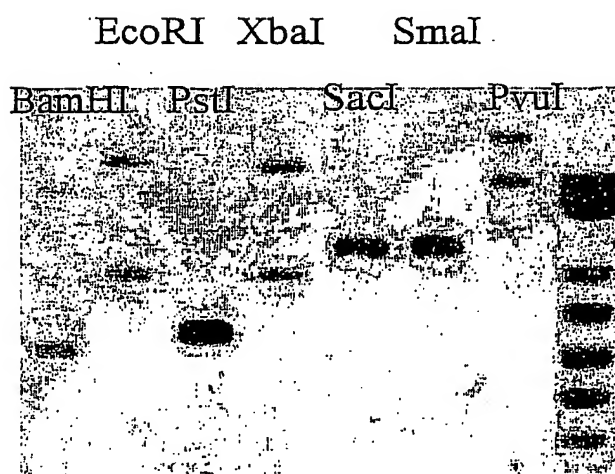


Figure 3 : Etude en Southern blot du gène codant pour la laccase de *Pynoporus cinnabarinus*

CTGCAGACATCTGGAGCGCCTGTCTTCCCTAGTATATAATGATGTCTGTCCGACAGTCTCTGAAGACCGCTCGAGTCCCACTTGAGTTTATAGGTAGGAC 100
 CTGTCCAGCAAAACCCCTCTTCTGATCATGTGAGGTTCCAGTCCCTCTTCTTCTCGTCTCTCCCTCACCCTGTGGCCAAACGACGACCATAGGSC 200
 M S R F Q S L F F F V L V S L T A V A N A A I G P 25
 CTGTGGCGGACCTGACCCCTTACCAATGCCAGGTCCAGCCGATGGCTCGCTCGCGAGGCGCTCGTGGTGAACGGTATCACCCCTGCCCTCTCATCAC 300
 V A D L T L T N A Q V S P D G F A R E A V V V N G I T P A P L I T 58
 AGGCAATAAGgtatgtatgtcgtcgtccctcagagctacatacatctgatcccaaatcgtttagGGCGATCGATTCCAGCTCAATGTCTATCGACGAG 400
 G N K G D R F Q L N V I D Q 72
 F2
 TTGACAAATCATACCATGTTGAAAACATCTAGTATTgtagggttcagtttttcccgactaccatgttatgaccatcccaactcgtag CATTTGGCAGCG 500
 L T N H T M L K T S S I H W H G 88
 (I)
 CTCTTCCAGCAGGACGAACTGGGCGGATGGTCCCGCGTCTGTGAACAGTGTCCCATCGCTTCGGGCCACTCGTTCTTGTATGACTTTCAGTTTCCC 600
 F F Q Q G T N W A D G P A F V N Q C P I A S G H S F L Y D F Q V P 121
 (II)
 GACCAAGCAGgtacgaattccgtacacgtttcattgctcgcaactaaacctcctcttactaggGACTTCTGTGATACCATAGCCATCTCTCCACGCAATA 700
 D Q A G T F W Y H S H L S T Q Y 137
 (II)
 CTGCGATGGTTTGGGGGGCTTTCGTCTCTACGACCCCAAGATCCTCAGCTAGCCTGTATGACATTGATAACGgtgagcagatcatggtatcgc 800
 C D G L R G F V Y D F N D P H A S L Y D I D N D 163
 tattgctccacttatgcttctggtcatccagACGACACTGTCTACGCTGGCTGATTGGTATCACGTTGCTGCAAGCTCGGACCTCGCTTCCCgtac 900
 D T V I T L A D W Y H V A A K L G P R F P 184
 gtytcaaatgtctacgagagatctcacatatacgtactagactcacttcgctgattacagATTGGCTCCGATTCAACCTTATCAATGGACTTGGTGGAA 1000
 F G S D S T L I N G L G R T 198
 CCACTGGCATAGCACCGTCCGACTTGGCAGTTATCAAGTCCAGCAGGGAAGCGgtatgtatggtggtcactcactgcacattggtctgatacatggc 1100
 T G I A P S D L A V I R V T Q G K R 216
 ctgtttccacagCTACCGCTTCCGCTTGGTGTCTCTTCTTCTGCGATCCGAACCATACATTACGATTGATAATCACACARTGACTATAATTTAGGGCGGA 1200
 Y R F R L V S L S C D P N H T F S I D N H T M T I I E A D 245
 CTCGATCAACACTCAACCCCTAGAGGTTGATTCAATCCAGATTTTTCCGCGCAGCGCTACTCTTCTGTGtagg tctgtaggctcctgtcatcaagtgtt 1300
 S I N T Q P L E V D S I Q I F A A Q R Y S F V 268
 cagacatcttagatacaccttttcaatgcagCTGGATGCTAGCAGCGGCTGGATAACTACTGGATCCGCGCAACCCCTCGCTTCCGAAACACAGGTT 1400
 L D A S Q P V D N Y W I R A N P A F G N T G F 291
 TTGCTGGTGAATCAATTTCCCATCTTCCGCTTATGATGGGCGACCCGAGATCGAGCTACGCTCTGTGTCAGACTACTCTACGAAGCTCTGAACGAGGT 1500
 A G G I N S A I L R Y D G A P E I E P T S V Q T T P T K P L N E V 324
 CGACTTGCATCTCTCTCGCCTATGCTGTGgtacgtgtctcaagaacctcgatcactaagtgcattgcaactcatatggtgcatgacagCCTGGCAGC 1600
 D L H P L S P M P V P G S 337
 CCCGAGCCCGGAGGTGTGCGACAAGCCTCTGAACTTGGTCTTCAACTTCTgtgagtagtggcgctcctcctgtagcacacgttcgaacaagcctgataccat 1700
 P E P G G V D K P L N L V E N F 353
 gcagAACGGCACCAACTCTTTCATCAACGACACACCTTTGTCCCGCGTCTGTCCAGTCTTGTACAAATCCTCAGTGGGGCGCAGGCGGCTCAGGAC 1800
 N G T N F F I N D H T F V P V P L L O I L S G A Q A A Q D 385
 CTGGTCCCGGAGGCGAGGTGTCTGTTCTTCCAGCAACTCTGCTTATGAGATATCCTT CCCTGCCACTGCCAATGCCCTTGGATTCCCCCATCCGTTCC 1900
 L V P E G S G V F V L P S N S S I E I S F P A T A N A P G F P H P F H 419
 (III)
 ACTTGCACGGTgtacgtctgcttccctcgtctaaaggcgaggtcgatatctgactcccatcacagCACGCCCTCGCTGTCTCGTCCGAGCGCC GGGAGC 2000
 L H G H A F A V V R S A G S 433
 (III)
 AGCGTCTACAACACTACGACAACCCGATCTTCCGCGACGTCTGTGACGACCCGCGAGCCCGGCGACR ACGTCACGATTCTGCTTCGAGACCAATAACCCAGGCC 2100
 S V Y N Y D N P I F R D V V S T G Q P G D N V T I R F E T N N P G P 467
 R8
 CGTGGTTCCTCCACTGCCACATTGACTTCCACCTCGACGCGAGGCTTTGCTGTAGTCATGGCCGAGGACACTCCGGACACCAAGGCCCGGAAC CCTGTTC 2200
 W E L H C H I D F H L D A G F A V V M A E D T P D T K A A N P V P 500
 (IV) (IV) (IV)
 TCAGGCGTGGTGGGACTTGTGCCCATCTATGATGCACTTGACCCAGCGACCTCTGAGCGGGAITGTACTGTGACCTGGT GTGGGGGAACATGT CGA 2300
 Q A W S D L C P I Y D A L D P S D L 518
 GGGCTTTCATCGATCAGGGACTTTCAAGGTTGGCATAATATACCTACGCGCTGGATGACTCGGACAGCGTGTGGCGTGGGTGTAACTCTGCTTGATGT 2400
 TGA AAAAGGATTTTATGTAGAACAATTTATGAGCAATCAGCAATCAATAGGATTGTGTCTGGTTTCAGCAAAATGTCTTGTCTCCCTGACATTACTTTTG 2500
 TGCGAGAAATGGGTCCATGATACATCATTTGAGCTCTCAATACCAAGAAGGATTACCCATGTCAATACCAAGATCATGTCTTCTGCTGTCCGCAATGG 2600
 TCTCATGTTGCGTTGAGCAGATCGCAGTACGTTGAAAAGCGATTAGTAT TACATGCAACATGCAACATTTGGAAGGGGGCATGACAGGTTTCAGCTCGCG 2700
 TCAGTCCGCCAAGTAGCGACCTTTGCCGCACTGCTGTTAACTGAAGGTATGCTTCAGAACTCCGTGGTATCGAGAGCGATCGTGTACGTTCCGGGAT 2800
 AGATCCATTGATCCCCGCTCTGGTCCGGCGGTGCGATGGCCCCGAGCGTCAACGGCAGCTTCGCGATCGCGCTTTTCTAGGGGCGAGGCGCTGTACCCG 2900
 CGTGTACGAGACGAGCTGCTTGTTCGGGTGGGGCGAAGGCCCGAAGGAGGCCACTCACGAAGAGCAATGCGACGTAATCCGAGGTAGCCTTGCCCGTGT 3000
 GTCACACGCGACGAGAACGTGTGAGCGGCGCGAGGTTCAGGAAGCGCGCGCTCTTCTGACCGCGCTGTACGAGGTCCGGAATCGAATACGTGATGGCG 3100
 GTCCTCCAAAGTCCGTGACGTTGGTCCGATCGGCGCGCGCGCTGGAGCTGCCCAAGAGAAATCGAAGGTGGTGAAGTGCAGTCCAAAGCCAAATTCGTA 3200
 GACCGCGTCCCGGTGTACCACTTGTATGTACGCCCGGGTTCGACGCGCTTGGGCGAAGGGT CATGTCACTCATCGGAACCTGATCAGCGTAGATGGCT 3300
 GGGTATTGGGTGATGGGCGAGCGCTCTGCGAG 3331

Figure 4 : Séquence du gène codant pour la laccase de *Pycnoporus cinnabarinus*

AGATCTCCGAACCAGAAATGCGATTGCGTTTCAGGCCCAATTAAGAATAAAGCTGCGTCAGGGCAGCGACGTA
TCTTGATCCATCATTGACTCACCGGCATCGGGCTCAACACCAAAGCAAGCTCGTCCCACCCATAGGCGTGCA
CCGGCCGGCGTGCGCCATTGAGGTACATGAGCGGGGCGAAAGTCCGCCATTGGTAGCCCTGTCGTGGACGCG
CGGCGATGAAACGTTTCCCAACATTGGGAAGAAACGTCTGCGGCCCATCATCCCTTCACCGGATGACAAGGC
GGCGTCGCGCCTTTGCCGAGAGGGCCGGCGGGCGACATGCACAGCGAAGGTCCGTTGCGGATGGGAAGCAGG
CAATCAGTGGGTGTCTACGCCGCCACGATGGTTCGGGGAGCGTAGGCGCCCTCCATAAGGCGGCAAGCATC
ATGATGCTCTCCGATTTCGGGAAGCCTGGTGCGATGCTGGAGAGACTCTCTCCGAGAGACCAGTGTGCGCAAC
GTTCTGCGCTGGAAGACTTTAAAGTGAGTGTAAGGGCGAGCAGAGGACGATCATCGGATTGCAGGAACC
ATCGGCATCCTCAGCCTGGGAAGGATGGCTCTTGGTAGACATTTCGCGGAAGGTGTCTAGATGTGAGCGGGC
TTCTTGGATGATCATGTGTAACCTTTTTCTGACCTCGTCGGTGGTACGCATGGCAGGATTGAGCATTACGGT
ATGCCTCCCATTCATAAACGATAACCCCTTCCTTCAGGTTGGTCATCTCCATAGAGCGGCACGCTCTCAAGG
CCTAGGCTATTACACCTCCTTCGCAACATCCCTATTACGGTGTCTGTAAGGAACGACTTGTTCATGGGATC
ACATGAAGTGCAGCATACTGTTCCGCCGTCTCGCAGTACAGACGCTAGTACGGGAAGTCGACATCCAAGCGT
TCAGTCACCACATGGCAAAAAAGCTGCACCATACTCTTTATGGTGAGTTGTTTCGTGAGTGGTATACAGTCAT
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CTCGGAAAAATAAGAAGAATATTGTAGGTGCGTGTAGGCGTATCGCCCAAATGCGCACACACGGAGGCTTTA
GGAGATGAAGCGCCCGTGAGCGGTAAAGGGAGTTGGTTACCGCCGCCCGACCGACTCTCTCTCTTTCCAG
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CTCATGACGTCCGCAATCCAGACCCTTAGCCGGTTCGTTACTCATCGTTATCCCTGCCGCCATGGTAGTGGA
GTCAGCCTGGCCAGTGCGTAGTCCCGTCTCTCTTGCTGCACTAGAGAAGCCCCATGAGACAGCGTTTTTTG
TTATTTCTGCTGTTTCTATAGACACCATAGGGGCAACGATCCTGCACGCCAGAGGTATGGGGCTCGTCA
GATTCACAGTTTTTTCTCCTCGGTCTGAATCGGCTGCACGGCAGATAAATCGGCCGGAAATGCTATAGCCCTT
CATAGCCCGCTATGAGAGTCGCAAAAGGCTTGTGAGTCAGGTTCGGTCGAGTGGCTCTCACGAAGAGCGTCAA
CTTCGCGCGACAGCCGCTTTCAGGGCAAGATAGATCCTCCCATCATCCCCTACTGCGCTCAGCGCCGGTAC
CGAACAATTGACTTACCGACATCCTCCGGGACGCGCAATGCTGTTTCGACGGAACGTAATCCTCTTCGTCCC
GCCTCTTTTCGCTCTCACGCATTCCTGTGTGGTTCGCGCGACGGCCGCTCATCAGGACCAGACAGTCTCAAT
GTCTGGTACCGGCACAATGGTGACACTGCGGCAACTGAGTAGGTCTGGTCACTCTGGTGCACCGTCGCTTAC
GCTGACCTTCGGGATACTGTCTGACAGATCTGGAGCGCCTGTCTTTCCCTAGTATAAATGATGTCTGTG
CGCAGGTCTTGAAGACCGCTCGAGTCCCCTTGAGTTTTAGGTAGGACCTGTCCACCAAACCCCTCTTTCT
GATCATG

Figure 5 : Séquence de la séquence promotrice du gène codant pour la laccase de *Pycnoporus cinnabarinus* (jusqu'à l'ATG codant pour la méthionine de la laccase)

6/13

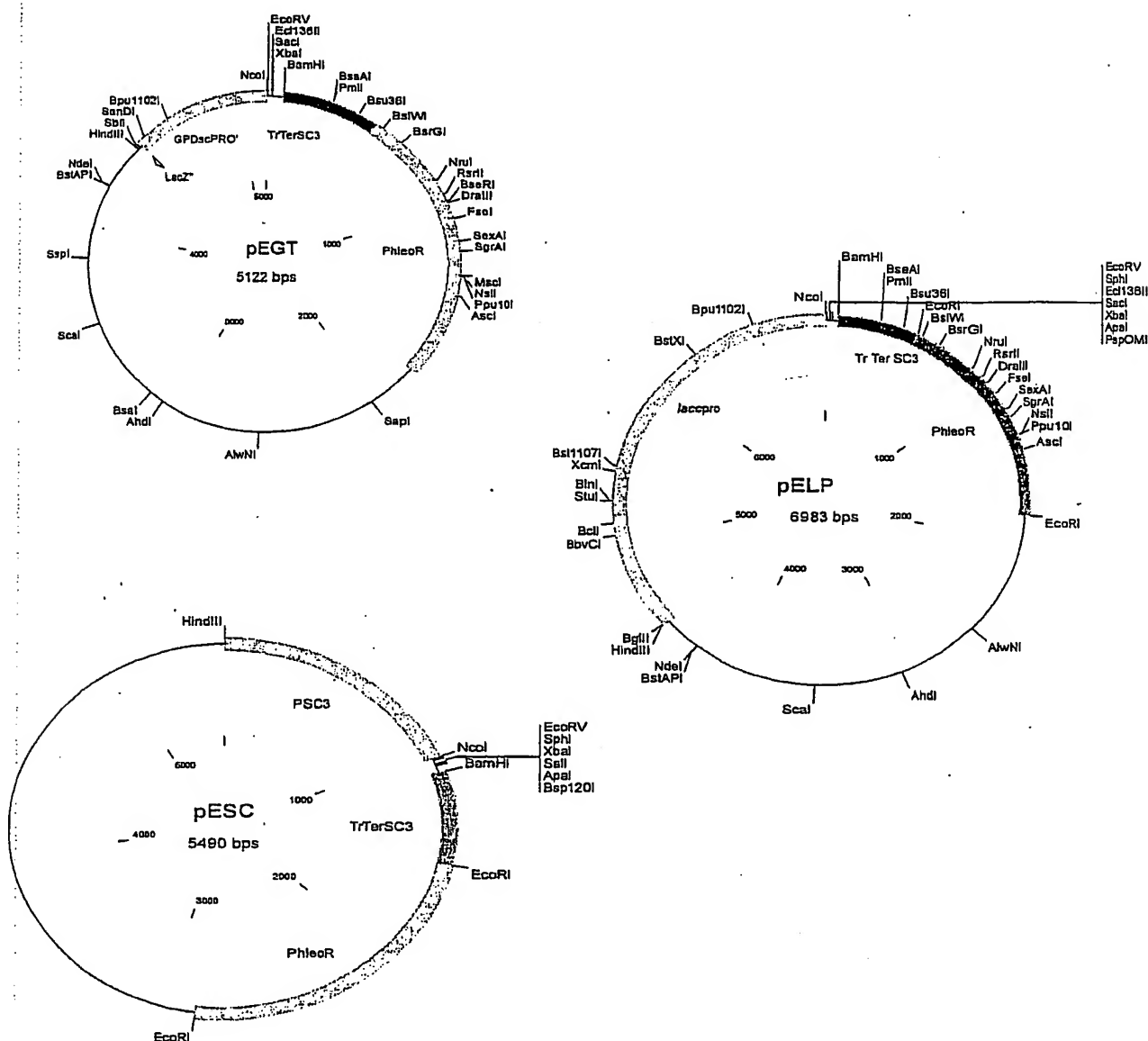


Figure 6 : Carte physique des trois vecteurs d'expression utilisés pour la production de la laccase chez *Pycnoporus cinnabarinus*

CATGGGATATCGCATGCCGTGCAGAGCTCTAGAGTCGACGGGCGCCGGTACCGCGGCCGCCCTTAAGACGCGTGGATCCGCAGGTGAAC
GCGCCTATCGGTGGGATATTCCGGCGACGGGAGCCTCGGCAATCTGAGCCTCGTACTGCCTAGCAAAATCGGAATCCCTTCGATGT
CATAGGGTCGCGGACAAAGTGATCGTCTTGCTACATACTCCAAGGTGTTGACTCATTCCCTCGATAATGAACATTGTTGTTGTTGTTG
TTCTCTATCCGCTCAGTCACGCGACCCACACGTGCATGGTTGAACCTTCGCCACGCAACACCGCATGACGACATGGCGAACCTAAG
TAAAGGCTGAGTCGTGGACTAAAGCACTCCACTTTACGGCGAGGATGCCAGTCTACGTCAATGAAGCCTCAGGTCCCGAAGTAA
GGGGGTACAAAAGGAGGGTGAAAGGTGGACGTTTTCTTACCATCCTTCCACCTCCAGACCACCATGCCGGGAATTCAGCTGTCT
CAAAAAGGTTCTGCCGTACGCCCGCGAAAATTCCTTCGAGGTGGGCCCTATCGCATACATGCACGCTTCAAAACAATCCATTCTATC
ATTTTGGGATCGTACAATTATTAGACATGTTGTACAACGTTACATTCCTTTCTTTTACTCTCCGGCCAGTCTATGTAGAGGTAAA
GTACAAGCGTCCAAAGGATCAGGCACTTAGAGCGCGCGCTTGTCTCGCGCTTAGAGCGCGCGCTCTGCTTCGCGCGTAGACG
AGCAGGTCCGAGACACGGCGGGAGTAGCCCACTGGTCTGACCCGCGCTGATGAACAGGTCACGTCGTCCCGGACCAACCGG
GGGATCGATCCACGCGTCTTAAGGCGCGCGCGGTACCCCTCGGACCCGTCGGCGCGCTCGGACCCGCGGTGTTGTCGCGTCCG
TCAGTCTGCTCCTCGGCCACGAAGTGCACGCAAGTGCAGGCGCGCGGTGCGCGAGGGCGAACTCCCGCCCCACGGCTGCTCGCGAT
CTCGGTCAATGGCGCGCGGAGGCGTCCCGGAAGTTCGTGGACACGACCTCCGACCACTCGGCGTACAGCTCGTCCAGGCGCGCAC
CCACACCCAGGCCAGCGGTGTTGTCGGCACCACTGGTCTGACCCGCGCTGATGAACAGGTCACGTCGTCCCGGACCAACCGG
GAAGTCGTCTCCACGAAGTCCCGGAGAAACCCGAGCGCGTGGTCCAGAACTCGACCGCTCCGGCGCGCTCGCGCGTGGCA
CCGGAACGGCACTGGTCAACTTGGCCATGCATGGTGATGGGCATTATGTGTGATGGGATGCGATGGGAGAGGGAAGTCTGATG
GGAGTGTGGAGAAAGAGGAGAGCGGCGGCGCGCCTTTATACCCAGCGCCGAAAGATCCGATCGTACTGACAAAACGGGA
TGAACACATCGCGCGCGCGCTGGACTGCGCGCCATCTGCAAATGCCAGCCAGTCCCGTCGGGCGCCACCAACCGCCTGGTCGAGT
CCCCCTCGAGGGCGACGCTCTATTCTATCCATGCGCGCAATTGCAGGTGCGCGGTGGAAGAACAGTCTTCGAGTCTCTCGCAC
TGGGCTGCGACCTGTCTACCTCTCATCTAAACCCCTCCGCGGCTTCGCACTACAGTTACTAATCTCACACCGAAGAGGCTCTCGCG
CACCCTCCGAGCACGTTCCCTTACATGCCACAGCGTCAGAATTGAACACAAATGCACGTCARATCAGATCCCGGGGAATTCGT
AATCATGGTCAATAGCTGTTTCTGTGTGAAATGTTTATCCGCTCAACAATACACACATACGACCGGGAAGCATAAAGTGAAG
CCTGGGGTGCCTAATGAGTGAAGTAACCTACATTAATGCGTGTGCGTCACTGCCCGCTTTCAGTCCGGAAACCTGTCGTGCCAGCT
GCATTAATGAATCGGCAACGCGCGGGGAGAGGCGGTTTGCATTTGGGCGCTTTCGCTTCTCGCTCACTGACTGCGTGCCTCG
GTCGTTGCGGTGCGCGGAGCGGTATCAGCTCACTCAAAGCGGTAAATACGGTATCCACAGAATCAGGGGATAACGCAGGAAAGAA
CATGTGAGCAAAAAGGCCAGCAAAAAGCCAGGAACCGTAAAAAGCGCGTGTGCTGGCGTTTTCATAGGCTCCGCCAGCG
AGCATCACAATAATCGACGCTCAAGTCAGAGGTGGCGAAACCCGACAGGACTATAAAGATACCAAGGCGTTTCCCCCTGGAAGCTCC
CTGTCGCTCTCTCTGTTCCGACCTGCCGCTTACCGGATACCTGTCCGCTTCTCCCTTCGGGAAGCGTGGCGCTTCTCATAGCTC
ACGCTGTAGGTATCTCAGTTCGGTGTAGGTGCTTCCGTCCTCAAGCTGGGCTGTGTGACGAAACCCCGTTCAGCCGACCGCTGCGC
TTATCCGGTAACATATCGTCTTGAAGTCCAAACCCGGTAAGACACGACTTATCGCCACTGGCAGCAGCCACTGGTAACAGGATTAGCA
GCGAGGTATGTAGGCGGTGCTACAGAGTTCTTGAAGTGGTGGCCTAACTACGGCTACACTAGAAGGACAGTATTTGGTATCTGCGCT
CTGCTGAAGGCAGTTACCTTCGGAAAAAGAGTTGGTAGTCTTGTAGTCCGGCAACAAACCCGCTGGTAGCGGTGGTTTTTGT
GCAAGCAGCAGATTACGCGCAGAAAAAAGGATCTCAAGAAGATCTTTGATCTTTTACGGGGTCTGAGTCTGTTTGTGTT
AACTCAGTTAAGGGATTTTGGTCATGAGATTATCAAAAAGGATCTTCACTAGATCTTTTAAATTAATAAATGAAGTTTTAAATCAA
TCTAAAGTATATAGGTAACTTGGTCTGACAGTTACCAATGCTTAATCAGTGAGGACCTATCTCAGGATCTGTCTATTTGCTTC
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CGCTCCATCCAGTCTATTAATGTTTCCCGGGAAGCTAGAGTAAGTATGTTCCGCGAGTTAATAGTTTGCAGCAAGTTGTTGCCATTGCT
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TGTTGTGCAAAAAGCGGTTAGTCTCTCGGTCTCCGATCGTTGTGACAGTAAGTTGGCGCAGTGTATCACTCATGTTATGGC
AGCACTGCATAATCTCTTACTGTATGCCATCCGTAAGATGCTTTTCTGTGACTGGTGAAGTACTCAACCAAGTCATTCTGAGAATAG
TGATGCGCGCAGCGATTGCTCTTCCCGGCGTCAATACGGGATAATACCGGCCACATAGCAGAACTTTAAAGTGTCTCATCATT
GGAAAAAGCTTCTCGGGGCGAAAACTCTCAAGGATCTTACGGTGTGAGATCCAGTTCGATGTAAACCACTCGTGACCCAACTGA
TCTTCAGCATCTTTACTTTACCAAGCGTTTCTGGGTGAGCAAAAACAGGAAGGCAAAATGCGCGCAAAAAGGGAATAAGGGCGAC
ACGGAATGTTGAATACTCATACTCTTCTTTTCAATATTATGAAGCATTTATCAGGGTTATGTCTCATGAGCGGATACATATTG
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TGACATTAACCTATAAAAAATAGGCGTATCAGGAGGCCCTTTCGCTCGCGGCTTTCGTTGATGACGGTGAACCTCTGACACATGC
AGCTCCCGGAGACGGTCAAGCTTGTCTGTAAGCGGATGCGGGGAGCAGACAAGCCCGTCAGGGCGCGTCAGCGGCTGTTGCCGGG
TGTCGGGGCTGGCTTAATATGCGGCATCAGAGCAGATTGTACTGAGAGTGCACCATATGCGGTGTGAAATACCGCACAGATGCGTA
AGGAGAAAAATACCGCATCAGGCGCCATTCCGCAATTCAGGCTCGCAAGTGTGGGAAAGGCGATCGGTGCGGGCCTCTTCGCTATTA
CGCCAGCTGGCGAAAGGGGGATGTGCTGCAAGGCGATTAAAGTGGGTAACGCCAGGGTTTCCAGTCACGACGTTGTAACGAC
GGCCAGTGCCAAGCTTGATGCTGCGAGGTGACGACCGAGCGCGGCCACCCAGCTATCCCGCGCGGGTCCGGACCCAAAATAA
GCGGGCCCCCGCGCGCCCGTCCGGCGAGCGGGTGTATCTACGAACGGAAGTGGGAGCGGACTCGGAAGAGATTGTTAGAAAGGG
GAACACCATCGCGGACGGCCAGTGCTCTGGDCAGCTGAGCGTGCAATTGTTCATTTGACCTGTGGCATGTAAGGAACGTGCTC
GGGATCGGAGGGTGGCGGAGAGCCTTTCGGTGTGAGATTAGTAAGTGTACTGCGAAGCGCGGAGGGGTAGGATGAGAGGTAG
ACAGGGTCGACGCCAGGTGCGAAGGACTGCAAGGACTGTTCTTCGACCGCGCACCTGCAATTGCGCGCATGGATAGAATAGA
GCGTCGCCCTCGAGGGGACTGCAAGGCGTGGTGGCGCCGACCGGACTGGCTGGGCAATTGCGAGATGGCGCGCAGTCCAG
GCCGCGCGCATGTGTTTATCCGTTTGTGCTAGTATCGATCGGATCTTTCGGCGTGGGTATAAAGCGCGCGCGCGCTCTCCCT
CTTCTCCAGCACTCCATCCAGACACTTCCCTCTCCATCGCATCCATCAACAATAATGCCCATCAC

Figure 7 : Séquence nucléotidique du vecteur pEGT, contenant le promoteur du gène *gpd* (4480-5122), un marqueur de résistance à la phléomycine (507-1822) et le terminateur du gène *sc3* (71-507).

AGCTTCTCCGGCCCCGAATCGAACGGCAGGATGTGTGGGCGTGTCCAATATTGCCATGAAAAATCTGTGAGAAGTGAGCCCTCTCGTCAC
CCTGTACAGCTTCGCTGAGTTGAAAAAGCAGGGTTTCATCTTGGGCTCACTGATGCACTGAGCTCGACCGGAGAACTAAATGACCAGCCGG
AGTGTTCACCTAACTTAACGCGGGTATTACAGGGCAGCTTCTCTATGTTGGCGCTACGACGTAGATCAACGCGCCATGAACGGGGGAAACG
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GCCAGTGTGTCGGGATGCCACTGTTGAGGCCATCCCTTTTGGTAGACAGACGGGAAAGAGCTTTGGAGGTGCGATTCTCTACGAAATGGGA
AGGGGCTTAGATGGAGAGTGACACGTCTGAGCTCCCCAACACGCCTTCGCCGAGGGTGCCTCTCCGCGGACATTACCTCAGTTCAATTG
TTCTGACCTGCCTAATTGTATAGACCGGCCAACAACTTGTGACGCCCATATAACAGTGCCCTGCACAGAGCCTTCCCACTCAGTCCGG
CGCTCCCTCAATCAATCCCACTAACTCGCCGGCTCTGCCCTTCGCCCTGCGACACGTGCGCTTGGAAAGAGCCGGGCAACGCGCTCCGC
TCCCCCTTCCCTCCGCGTCTGATGCACGACGCTTAATGTTGTGCGAGCGAGCCGTAAGTATATTCAAAGGCGTAGCGAAATGAATAG
CAGGCGCGCGGGACCTGGCAGCGCGCGCATGAACATGCAGACTTGGGTGACGATAACTTGAACACAGCGCGCGCAATGAATATCCA
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TCAACTACCGAGCCCTTCTTCTCGCTATCCTTCYTTACAACCTGCTCGCCATGGGATATCGCATGCTGCAGAGCTCTAGAGTCGAC
GGGCGCGGTACCGCGCGCGCTTAAGACGCGTGGATCCGCAGGTGAACGCGCCTATCGGTGGGATATTCCGGCGACGGGAGCCTCGGC
AATCTGAGCCTCGTTACTGCTAGCAAAATTCGGAATCCCTCGATGTCTATAGGGTGCAGGACAAGTATCGTCTTGCTACATACTCCAAG
GTGTTGACTCATTCCTCGATAATGAACATTTGTTGTTGTTGTTGTTCTCTATCCGCTCAGTCACGCAACCCACAGTGCATGTTGAAC
TTCCGCCACGCAACACCGCATGACGACATGGCGAACCTAAGTAAAGGCTGAGTGGATGAGTAAAGCACTTAAGCACTTACGCGAGGATGC
CAGTCTACGTATGAATGAAGCCTCAGGTCCCGAAGTAAGGGGGTACAAAAGGAGGGTGAAAGGTGACGTTTCTTACATCCTTCCA
CCTCCAGACACCATGCCGGGAAATCCCAAGCTTGTCTAAAAAGGTTTTCGCCGTACGCCCCGCAAAATTCCTTCGAGGTGGCCCTATCG
CATACATGCACGACTTCAAAACATCCATTCTATCATTTTGGGATCGTACAATTATTAGACATGTTGTACAACGTTTACCTTCTCTCT
TTACTCTCCGGCCCACTGATAGAGGTAAAGTACAAGCGTCCAAAGGATGCGCATGAGTAAAGCACTTACGCGAGGATGCGAGGAGTGC
AGCGCGCGCTCTGCTTCGCCGCGTAGACGAGCAGGTGCGACACGCGCGGAGTAGCCCCACTCGTTGTCTGATACCAGGCAATGAGCTT
CACGAAGCTCTTGCTGATCGCGATGCCGGGATCGATCCACGCGTCTTAAGGCGCGCGCGGTACCCCTCGGAACCGTCCGGCGCGCTC
GGACCGCGCGGTGTTGGTCCGGCTCGGTCACTGCTCTCCGCGCAAGTGCACGCAAGTTCGCCGCGCGGTTCGCCGCGCGGTTCGCCG
CCGCCCCACGCGTGTCTCGCGATCTCGGTCAATGGCGCGCGCGGAGGCGTCCCGGAAGTTCGTGGACACGACCTCCGACCACTCGGCGT
ACAGCTCGTCCAGGCGCGCACCCACACCCAGGCCAGGGTGTGTCGCCGACCACTGCTGTCGGAACCGCGGTGATGAACAGGGTCAAG
TCGTCCCGGACACACCGGCGAAGTCTCCTCCACGAAGTCCCGGAGAACCCGAGCCGGTCCGTCGGAACACTCGACCGCTCCGGCGT
GTGCGCGCGGTGAGCACCGGAACCGGCACTGCTCACTTGGCCATGCAATGGTGAATGGGCAATTATGTGTATGGGATGCGATGGGAGAG
GGAAAGTGTCTGGATGGGAGTGTGGAGAAAGAGGGAGACGCGGGCGCGCGCTTTTATACCCACGCGCGAAAGATCCGATCGATA
CTGACAAAACGGGATGAACACATCGGCGCGCGCGCTGGAAGTTCGCGCCATTCGCAAAATGCCAGCCAGTCCCGTCCGGCGCGCACCA
GCCCTGTCGATGCCCTCGAGGGCGACGCTCTATCTATCCATGCGCGCAATTCGAGGTGCGCGGTTCGGAAGCAAGTCTTCGAGT
CCTTCTCGCACCTGGGCTGCGACCTGTCTACCTCTACCTCTAACCCCTCCGCGGCTTCGCGAGTACAGTTACTAATCTCACCCGAAGAG
GCTCTCGCGCCACCTCCGATCCGAGCAGCTTCCTTACATGCCACAGCGTCAGAAATGAACACAATGCACGTCTARATCAGATCCCCGG
GAATTCGTAATCATGGTCATAGCTGTTTCTGTGTGAAATTTGTTATCCGCTCACAATTCACACAACTACGAGCCGGAAGCATAAAGTG
TAAAGCTCGGGTGCCTAATAGTGAGCTAACTACCAATTAATGCTTGGCTGCGCTCACTGCCCGCTTCCAGTCCGGAACACTGCTCGTCCA
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GGTCTGTTCCGGTTCGCGCGAGCGGTATCAGCTCACTCAAAGGGCGTAATACGTTATCCACAGAAATCAGGGGATAACGCAAGGAAAGAC
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ATCACAAAATCGACGCTCAAGTCAAGGTGGCGAAACCCGACGAGGACTATAAGATACAGGCGTTTCCCTGGAAGCTCCCTCGTG
CGCTCTCTGTTCCGACCTGCGCTTACCGGATACCTGTCCGCTTCTCCCTTCGGAAGCGTGGCGCTTCTCATAGCTACGCTGTA
GGTATCTCAGTTCCGTGTAGGTCTGCTCTCAAGCTGGGCTGTGTGACGAACCCCGCTTCAGCCGACCGCTGCGCTTATCCGGTA
ACTATCGTTGAGTCCAAACCGGTAAGACACGACTTATGCCACTTACGCACTGCTGTAACAGGATTAGCAGAGCGAGGTATGTA
GGCGGTGCTACAGAGTCTTGAAGTGGTGGCCTAACTACGGCTACACTAGAAGGACAGTATTTGGTATCTGCGCTCTGCTGAAGCCAGTT
ACCTTCGGAAAAAGAGTTGGTAGCTCTTGAATCCGGCAACAAACCAACCGCTGATGCGGTGGTTTTTTGTTTGAAGCAGCAGATTAACG
CGCAGAAAAAAGGATCTCAAGAAGATCCTTTGATCTTTTACCGGGCTGACGCTCAGTGAACGAAAACTCAGTTAAGGGATTTT
GGTCATGAGATTATCAAAAGGATCTTCACTAGCTTTTAAATTAATAAGTATTAATCAATCTAAAGTATATAGTAAAGTAAAC
TTGGTCTGACAGTTACCAATGCTTAATCAGTGAGGCACCTATCTCAGCGATCTGTCTATTTCTGTTTCATCATAGTTGCTGACTCCCGCTC
GTGTAGATAACTACGATACGGGAGGGCTTACCACTGTGCCCGAGTGTGCAATGATACCGCGAGACCCAGCTCACCGGCTCCAGATTT
ATCAGCAATAAAACGACGCGGGAAGGCCGAGCGCAGAAAGTGGTCTGCTGCAACTTATCCGCTCCTCACTCAATTAATTGTTGCC
GGGAAGCTAGAGTAAGTAGTTCGCGAGTTAATAGTTTGGCGAACGTTGTTGCCATTGCTACAGGCATCGTGGTGTACGCTGCTGTTG
GTATGGCTTCATTCAGCTCGGTTCCTCAACGATCAAGGCGAGTTACATGATCCCCATGTTGTGCAAAAAAGCGGTTAGCTCCTTCGGTC
CTCCGATCGTTGTGCAAGTAAGTTGGCCGAGTGTATCACTCATGTTATGCGAGCACTGCATAATTCTCTTACTGTCTATGCCATCCGT
AAGATGCTTTTCTGTGACTGGTGAGTACTCAACCAAGTCACTTCTGAGAAATAGTGTATGCGGCGACCGAGTTGCTCTTGCCTCGCTCAAT
ACGGGATAATACCGCGCCACATAGCAGAACTTTAAAAAGTGTCTATCATTTGAAAAACGTTCTTCGGGGCGAAAACTCTCAAGGATCTTAC
CGCTGTTGAGATCCAGTTTCGATGTAACCCACTCGTGCACCCAACTGATCTTCAGCATCTTTTACTTTCACCAAGCGTTTCTGGGTGAGCAA
AAACAGGAAGGCCAAAAATGCCGCAAAAAAGGGAATAAGGGCGACACGGAATGTTGAATACTCATACTCTTCTTTTCAATATTATGA
AGCAATTATCAGGGTTATTGTCTCATGAGCGGATACATTAATTTGAATGATATTGAAAAAATAAAATAAGGGTTCGCGCACATTTCCC
CGAAAAAGTCCACCTGACGTCTAAGAAACCATTAATATCATGACATTAACCTATAAAAAATAGGCGTATACGAGGCCCTTTCGTCTCGC
GCGTTTCCGTGATGACGGTGAAAACTCTGACAGCATGCGCTCCCGGAGACGCTCACAGCTTGTCTGTAAGCGGATGCCGGGAGCAGAC
AAGCCCGTCAGGGCGCTCAGCGGGTGTGGCGGGTGTGGGCTGCTTAACTATGCGGCATCAGAGCAGATTGTATGAGAGTGCAC
CATATGCGGTGTGAAATACCGCACAGATGCGTAAGGAGAAAAATACCGCATCAGGCGCAATTCGCCATTCAAGGCTGCGCACTGTTGGGA
AGGCGGATCGGTGCGGGCTCTTCGCTATTACGCCAGCTGGCGAAAGGGGGATGTGCTGCAAGGCGATTAAAGTTGGGTAAAGCCAGGGT
TTTCCAGTCACGACGTTGTAACGACGCGCCAGTGCCA

Figure 8 : Séquence nucléotidique du vecteur pESC, contenant le promoteur du gène sc3 (1-1033), un marqueur de résistance à la phléomycine (1540-2855) et le terminateur du gène sc3 (1104-1540)

CATGGGATATCGCATGCGCTGCAGAGCTCTAGAGTCGACGGGCCCGGTACCGCGGCCCGCTTAAGACGCGTGGATCCGCAGGTGAACGCGC
CTATCGGTGGGATATTCGGGCGACGGGAGCCTCGGCAATCTGAGCCTCGTTACTGCCTAGCAAATTCGGAATCCCTTCGATGTCATAGGGT
CGCGGACAAGTGATCGTCTTGCTACATACTCCAAAGGTGTGACTCTTCCCTCGATAATGAACATTGTGTGTTGTTGTTCTCTATCCGC
TCAGTCACGCGACCCACACGTGCAATGGTTGAACCTCGCCACGCAACAACCGCATGACGACATGGCGAACCTAAGTAAAGGCTGAGTCGT
GGACTAAAGCACTCCACTTTACGGCGAGGATGCCAGTCTACGTCATGAATGAAGCCTCAGGTCCCGAAGTAAAGGGGTACAAAAGGAGG
GTGAAAGGTGGACGTTTTCTTACCATCCTTCCACCTCCAGACCACCATGCGCGGAATTCACAGTTGCTCAAAAAGGTTCTGCCCGTACG
CCCGCGAAATTCCTTCGAGGTGGCCCTATCGCATACTGCACGACTTCAAAACATCCATTCTATCATTTTGGGATCGTACAATTATTAGA
CATGTTGTACAACGTTACATTCCTTTCTTTTACTCTCCGGCCAGTCTATGTAGAGGTAAGTACAAGCGTCCAAAGGATCAGGCACTT
AGAGCGCGCGCTTGTCTCGCCGCTTAGAGCGCGCGCTCTGCTTCGCCGCGTAGACGAGCAGGTGCGAGACACGGCGGGAGTAGCCCC
ACTCGTTGTCGTACCAAGCAATGAGCTTCACGAAGCTTGTCTGTATCGGATGCCGGGGATCGATCCACGCGTCTTAAGCGCGCCGCGGT
ACCCCTCGGACCCGTCGGGCGCGCTCGGACCGCGGTGTTGGTGGCGTGGTCACTCTGCTCTCGGCCACGAAGTGCACGCAAGTTG
CCGGCGGGGTCCGCGAGGGCGAATCCCGCCCCACGGCTGCTCGCGCATCTCGGTCTATGGCCGGCCCGGAGGCGTCCCGGAAGTTCTGTG
GACACGACCTCCGACCACTCGGCGTACAGCTCGTCCAGGCCGCGCACCCACACCCAGGCCAGGGTGTGTCCGGCACCACTGGTCTGTG
ACCGCGCTGTAGAACAGGGTCACTGCTCCGGGACCAACCGGGCGAAGTGTCTCCACGAAGTCCCGGAGAACCCGACCGCGGTG
CAGAACTCGACCGCTCCGGCGACGTGCGCGCGGTGAGCACCGGAACCGCACTGGTCAACTTGGCCATGCAATGGTGATGGGCATTATGTG
TGATGGGATGCGATGGGAGAGGGAAAGTGCTCTGGATGGGAGTGTGTGGAGAAAGAGGGAGACGGCGGGCGCGCGCTTTTATACCCACG
CCGAAAGATCCGATCGATACGTAAGTGAACAAACGGGATGAACACATCGGCGCGGCGCTGACTGCGCGCATCTGCAAAATGCCAGCCAGTC
CCGTCCGGCGCCACCAACGCGCTGGTTCGAGTCCCCCTCGAGGGCGACGCTCTATTCTATCCATGCGCGCAATTGCAGGTGCGCGGTGCA
AGAACAGTCTTTCGAGTCTTCTCGCACCTGGGCTGCGACCTGTCTACCTCTCACTCAACCCCTCCGCGGCTTCGCACTACAGTTACTA
ATCTCACACCGAAGAGGCTCTCGCGCCACCTCCGATCCCGAGCAGTTCCTTACATGCCACAGCGTCAGAATTGAACACAATGCACGTC
ARATCAGATCCCGGGAATTCGTAATCATGGTCAATGCTGTTTCCGTGTGAAATTTGTTATCCGCTCAACAATCCACACAACATGCAGGCC
GGAAGCATAAAGTGTAAAGCCTGGGGTGCCTAATGAGTGAGCTAACTCACATTAATTGCGTTGCGCTCACTGCCCGCTTTCAGTCCGGGA
AACCTGTCTGTCAGCTGCAATTAATGAATCGGCCAACCGCGCGGGGAGAGGCGGTTTGGCTATTGGGCGCTCTTCCGCTTCTCGCTCACTG
ACTCGTTCGCTCGGTGCTGCGGCGAGCGGTATCAGCTCACTCAAAAGGCGGTAATACGGTATCCACAGAATCAGGGGATAACG
CAGGAAAGAACATGTGAGCAAAAAGCCAGCAAAAAGGCCAGGAAACCGGTAAAGAGCCGCGTTGCTGGCGTTTTCATAGGCTCCGCCCC
CCTGACGAGCATCAAAAAATCGACGCTCAAGTCAGAGGTGGCGAAACCCGACAGGACTATAAAGATACCAGGCGTTTCCCCCTGGAAG
CTCCCTCGTGGCTCTCTGTTCCGACCCCTGCGGCTTACCGGATACCTGTCGCGCTTCTCCCTTCGGGAAGCGTGGCGCTTCTCATAGCT
CACGCTGTAGGTATCTCAAGTTCGGTGTAGGTGCTTCCGCTCAAGTGTGGCTGTGTGCAACGAAACCCCGCTCAGCCGACCGCTGCGCCTT
ATCCGGTAACATATCGTCTTGAGTCCAACCCGGTAAGACACGACTTATCGCACTGGCAGCAGCCACTGGTAACAGGATTAGCAGAGCGAG
GTATGTAGGGGTGCTACAGAGTTCTTGAAGTGGTGGCCTAACTACGGCTACACTAGAAGGACAGTATTTGGTATCTGCGCTCTGCTGAAG
CCAGTTACCTTCGGAAGAGAGTTGGTAGCTCTTGTACCGGCAAAACCAACCCGCTGGTAGCGGTGGTTTTTTGTTTGAAGCAGCAGA
TTACGCGCAGAAAAAAGGATTCAGAAAGATCCTTTGATCTTTCTACGGGGTCTGACGCTCAGTGGAAACGAAACGCTTAAGGGA
TTTTGGTCATGAGATTATCAAAAAGGATCTTCACCTAGATCCTTTTAAATTAATAAAGTGTAAATCAATCTAAAGTATATATGAGTA
AACTTGGTCTGACAGTTACCAATGCTTAACTAGTGAGGACCTATCTCAGCGATCTGCTATTTCTGTTTCAATCCATAGTTGCTGACTCCCCG
TCGTGTAGATAAATACTACGATACGGGAGGGCTTACCATCTGGCCCCAGTGTGCAATGATACCGGAGACCCACGCTACCGGCTCCAGATT
TATCAGCAATAAACACGACGCGCGGAAGGGCGGAGCGCAGAAAGTGGTCTGCAACTTTATCCGCTCCATCAGTCTATTAATTGTTGCC
GGGAAGCTAGAGTAAGTAGTTCCGCAAGTTAATAGTTTGGCAACGTTGTTGCCATTGCTACAGGCATCGTGGTGTACGCTCGTCTGTTGG
TATGGCTTCATTACGCTCCGGTTCCTCAACGATCAAGGCGAGTTACATGATCCCCATGTTGTGCAAAAAAGCGGTTAGCTCCTTCGGTCTCT
CCGATCGTTGTGAGAAAGTAAAGTTGGCCGAGTGTATCACTCATGTTATGGCAGCACTGCATAATCTCTTACTGTGTCATGCCATCCGTAA
GATGCTTTTCTGTGACTGGTGAAGTACTCAACCAAGTCATTCTGAGAATAGTGTATGCGGCGACCGAGTTGCTCTTGGCCGCGCTCAATACG
GGATAATACCGCGCCACATAGCAGAACTTTAAAGTGTCTATCATTTGGAACAGTTCTTCCGGGGCGAAAACTCTCAAGGATCTTACCGCT
GTTGAGATCCAGTTTCGATGTAAACCACTCGTGACCCCACTGATCTTCAGCATCTTTTACTTTCACAGCGTTTCTGGGTGAGCAAAAAA
GGAAGGCAAAATGCCGCAAAAAGGGAATAAGGGCGCAGCGGAATGTTGAAATCACTACTCTCTTTTCAATATTATTGAAAGCATT
TATCAGGGTTATTGTCTCATGAGCGGATACATATTTGAATGTATTTAGAAAAATAAACAAATAGGGGTTCGCGCACATTTCCTCCGAAAAA
TGCCACCTGACGTCTAAGAAACCATTAATATCATGACATTAACCTATAAAAAATAGGCGTATACAGAGGCGCTTTCGTCGCGCGTTTCGG
TGATGACGCTGAAAAACCTTGACACATGCAGCTCCCGGAGACGCTGACAGCTTGTCTGTAAGCGGATGCCGGGAGCAGCAAGCCGCTCA
GGGCGCGTACGCGGTGTTGGCGGTGTCGGGGTGGCTTAACTATGCGGCATCAGAGCAGATTGTAAGTGTGACAGTATGCGGTG
TGAATACCGCACAGATGCGTAAGGAGAAAAATACCGCATCAGGCGCCATTGCGCAATTCAGGCTGCGCAACTGTTGGGAAGGGCGATCGGT
CGGGCGCTCTTCGCTATTACGCCAGCTGGCGAAAGGGGGATGTGCTGCAAGGCGATTAAAGTTGGGTAAACGCCAGGGTTTCCAGTCAAG
ACGTTGTAAAAACGACGGCCAGTGCCAAAGCTTAGATCTCCGAACCAAGAAATGCGATTGCGTTTACGGCCCAATTAAGAAATAAAGCTGCGTCA
GGGACGCGACGTATCTTGATCCATCATTTGACTCACCGGCATCGGCGTCAACACCAAAAGCAAGCTCGTCCACCCATAGGCGTGCACCGGC
CGCGGTGCGCCATTGAGGTACATGAGCGGGGCGAAAGTCCGCCATTGGTAGCCCTGTGCTGAGCGCGCGCGATGAACGTTTCCCAACCA
TTGGGAAGAAACGTCTCGGCCCCATCATCCCTTACCCGATGACAAGCGCGCTGCGCGCTTTGCCGAGAGGCCGGCGGGCGACATGCA

Figure 9 : Séquence nucléotidique du vecteur pELP, contenant le promoteur du gène laccase (4457-6983), un marqueur de résistance à la phléomycine (507-1822) et le terminateur du gène sc3 (71-507) (suite de la séquence, page suivante)

CAGCGAAGGTCCGTTGCGGATGGGAAGCAGGCAATCAGTGGGTGCTCTACGCCGCCACGATGGTTCGGGGAGCGTAGGCGCCCTCCCA
TAAGGCGGCAAGCATCATGATGCTCTCCGATTCGGGAAGCCTGGTGCGATGCTGGAGAGACTCTCTCCGAGAGACCAGTGTGCGCAAC
GTTCTGCGCTTGAAGACTTTAAAGTGAGTGTAGAAGGGCGAGCAGAGGACGATCATCGGATTGCAAGGAACCATCGGCATCCTCAGC
CTGGGAAGGATGGCTCTTGGTAGACATTCGCGGAAGGTGTCTAGATGTGAGCGGGCTTCTGGATGATCATGTCTGTAACCTTTTCTGA
CCTCGTCCGTGGTACGCAATGGCAGGATTGAGCATTACGGTATGCCTCCCATTCATAAACGATAACCCCTTCCTTCAGGTTGGTCACTC
CATAGAGCGGCACGCTCTCAAGGCCTAGGCTATTCACACCTCCTTCGCAACATCCCTATTCACGGTGTCTGTAAGGAACGACTTGTCA
GGGATCAGATGAAGTGCAGCATACTGTTCCGCCGTCTCGCAGTACAGACGCTAGTACGGGAAGTCGACATCCAAGCGTTCAGTACCA
CATGGCAAAAAAGCTGCACCATACTCTTTATGGTGAGTTGTTCGTGAGTGGTATACAGTCATTTCATGAGGGAATGCCACCGGATAGG
GTGTGGCGGCCGCAATATTCATCGCCTGGCAATAGTCGATGTGCGTCTTGTTCATGAATATCATGGGTCACATGTGGAGACGGTTAA
ACAGCGTTGACTGTGAATCCCTGGTGTGTGTGGGCCGAACAGGTACGTTGCAGGAACACCAATATCTCTTCGGCAGCCAGTTCCTTG
CGAGCGGCACAGGCAGGCATCGCGCAACAGATCCCAAGCCATCCGCGCTCTGACATTCGGGATACCTGAAGCCCTTCAGGTACGGAGC
GAAGAGGTGGGCTCTCTGCAGCGATTGGCGGACGGATAGCTGATTTCTCTCTCACCATTGGGAAGATGTGAAAGGCTCCATCATAT
AGCGGCTCAACTCTACCTCGAATGTCCAAACAGCGCGGGAATACTTATTTATGTGGACAAGGCCGAGCTATGATAGCTTGCTCCCGAA
GTTGGTAAGTCCCGCAATCTGCGGTTTCAGGCAACAGTCTCGGAAAAATAAGAAATATTTAGGTGCGTGTAGGCGTATCGCCCAAA
TGCGCACACACGGAGGCTTTAGGAGATGAAGCGCCCGTGAGCGGTAAGGGAGTTGGTTACCGCCGCCCCGACCGACTCTCTCTCTT
CCAGCATCATGTCTCGGCGCAAACTTTACCCCTCTATTGACCACTCCACGAGAAAGCAGGAACAGCTTCCTTGTCTCTCATGACGTCC
GCAATCCAGACCCCTTAGCCGGTTCGTTACTCATCGTTATCCCTGCCGCCATCGTAGTGGAGTCAACCTGGCCAGTGCCTAGTCCCGTCT
CTCTTGCTGCACTAGAGAAAGCCCATGAGACAGCGTTTTTGTCTTATTTCTGCTGTTTCTATAGACACCATAGGGGCAAAACGATCCTG
CAGCCCAGAGGTATTGGGCTCGTCAGATTCCAGTTTTCTCTCGGTCTGAAATCGGCTGCACGGCAGATAAATCGGCCGGAATGCT
ATAGCCCTTCATAGCCCGCTATGAGAGTCGCAAAAGGCTTGTGAGTCAGGTTCGGTTCGAGTGGCTCTCACGAAGAGCGTCAACTTCGG
CGACAGCCGCTTTAGGGCAAGATAGATCCTCCCATCACTCCCTACTGCGCTCAGCGCCGGTACCGAACAATTGACTTACCGACATC
CTCCGGGACGCGCAAAATGCTGTTGACGGAACGTAATCCTCTTCGTCGCCGCTCTTTTCGCTCTCAGCATTCCGTGTGGTTCGCGCGA
CGGCCGCTCATCAGGACCAGACCACTCTCAATGTCTGGTACCGGCACAAATGGTGACACTGCGGCAACTGAGTAGGTCTGGTCACTCTG
GTGCAACGCTCGCTTACGCTGACCTTCGGGATACTGTCTGCAGACATCTGGAGCGCCTGTCTTCCCTAGTATAAATGATGTCTGTCC
GCAGGTCTTGAAGACCGCTCGAGTCCCACTTGAGTTTTAGGTAGGACCTGTTCTCCCAACCCCTCTTTC

**Figure 9 : Séquence nucléotidique du vecteur pELP (suite),
contenant le promoteur du gène laccase (4457-6983), un
marqueur de résistance à la phléomycine (507-1822) et le
terminateur du gène sc3 (71-507)**

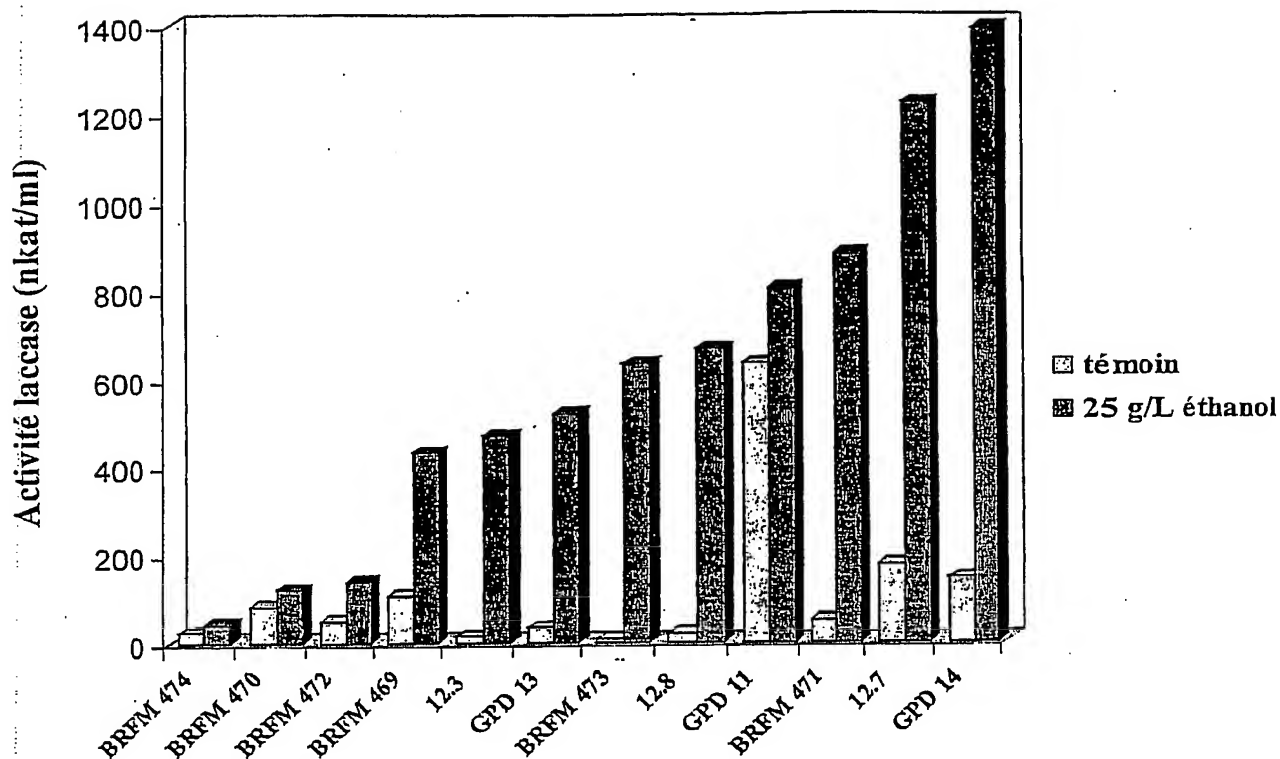


Figure 10 : Résultats de production des transformants présentant les activités les plus importantes. La culture a été effectuée avec ou sans (témoin) éthanol

12/13

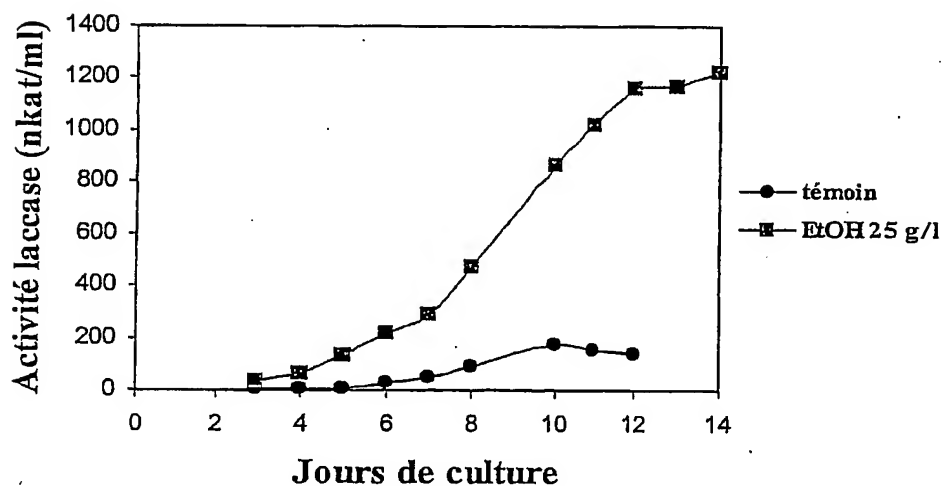
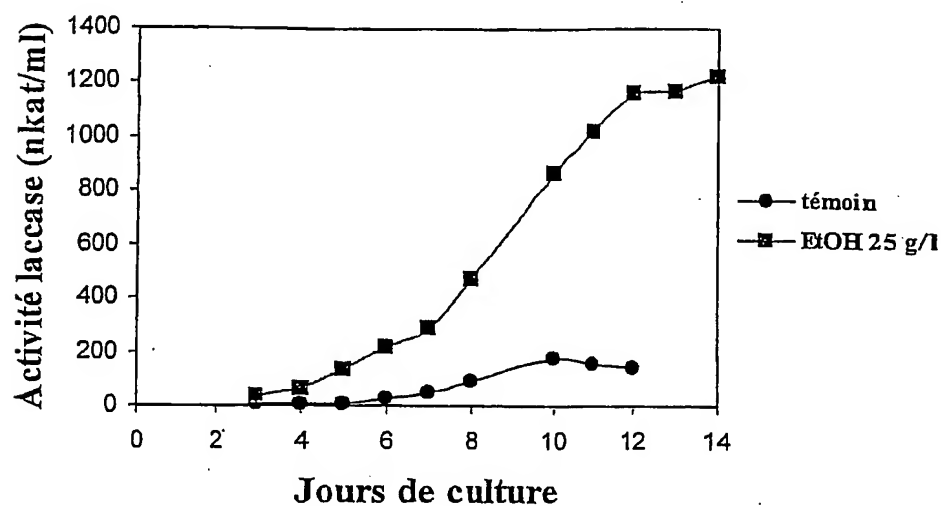


Figure 11 : Suivi des activités laccase des transformants GPD 14 et 12.7 en fonction du temps avec ou (témoin) sans éthanol

13/13

TGGGGAGATGGTTCTATATATCAAAATGATCTTCTGTCTGAGCTTTCCTCGTCTTGTGTTTCTGCTTGTCTAGTGGCCGACATGCTTTTATTAAACCAT 100
 TGGCGAGCTGCCCGCGCCCAAGGAGATAGCATAATCGCCTGAGAAACCTAGTCTGTCTCATGGCCGTGTAAACCGTTCTTGGGACTTATTTCGCACTTCTC 200
 TCAGAAATATAAGGCCTATTGTGATACGGTTCATCTAACCCAGCGCTCCCTCCGAAAGATGGGCTGCTCTCTCACTCTTCGCACTTCTTACTGCTTTAAA 300
 CTCAGTTCATGCCGCTGTGGGTCCCCTTACGGACTTAACACTGATCGTAGATACTGTGCCCCCGACGGTGTCTCTCACTCTTCGCACTTCTTACTGCTTTAAA 14
 S V H A A V G P V T D L T L I V D T V A P D G A A F A R E 43
 CGACTGTAAATGCCGGATTTGAGTTTCTAATTATAATCTTCCAGCCATTTGTCTGCTCAAGAGGAACCAAACTCCGTCATTTGGTCCGGTTCATCGT AGGTGGG 500
 TAGCTACAGTCTTCTCTCTTCACTTCTGCTCATCACCAAGTGATATGATATTAATTAAGGTCAAAAGGGGACAACTTCGGCTCAATGTTTATCAACAT 600
 TTGGATTCTCCGAACATGCGCAATCTACTTCCATTCTATGGCATGGCATCTTCCAGGAACGGTACGTGGTATATCGGATATCTATCTGTATCCATT 700
 L D S P N M R Q S T S I H N H G I F Q G N 95
 GACTCGAATATAGCTCAGAAATGGGCTGGTGGCTTGGCCTTCTGAAGCCTGTGCTCGAATTTATCTTCTGATTTTATGATGGCGCCGCAITTC GTTAACC 800
 AGSTAAGGAGATGTTCTGCTTCTGCTTCCCCAGAACTAATTATCTCTAGTGCCTTCCCTTCCCTGCTTCTTCTGATGGCGCCGCAITTC GTTAACC 900
 Q C P I A P G G D S F L Y D E T E P 125
 TTCCAGACTGGCACATTTTGGTATCACTCCCATTTATCACTCAATCTGCGATGGACTGAGGGGAGCATTCGTCGCTTCTCTCTTCTCATCAAGTCA 1000
 F Q T G T F W Y H S H L S T Q Y C D G L R G A F V 150
 CCGCTTCTTCTCACTTATCTAGATCTACGATCCGCTCGACCTTACCGGTTGCTCTACGATCTCGACGACGATCGACTGTGATTACTCTGGCGGACTG 1100
 I Y D P L D P Y R L L Y D V D D E S T V I T L A D W 176
 GTRCCACAGCTATGCGGAGGACATTTCTAATCGCTAGGAGATTTTCCCAAGATGTCTCTCTGCTCTCTGAAATCCATGAAC TAGTGCAGG GACACTA 1200
 Y H S Y A E D I L I A A G D T 191
 TCCCTCATCAATGGTACGGAAGATTCGCGGAGCGGAGAACGGCAACAGAACTATCTGTCTTACTGTTGAGCATGGAAGCGGTAGGCAATCTCTCCCT 1300
 I L I N G H G R F A G A G G T A T E L S V I T V E H G K R 220
 CGGCTTGTAGATGTGCTAATTTGTGATAGCTACCGATTGCGATTTGCCAATATCGCTTGTGACCTTGGTTTGGCGTGAAAATCGATAGCCATACGAA 1400
 Y R L R F A N I A C D P W F A V K I D S H T N 243
 CCTTCCGCTTATCGAAGCTGACGCTATTACTACTGTGCTTGTACCGGTGGACTCCTTCAATGTAGGCTTACCCTTAGCACTTTCCCACTCTGGATCTCT 1500
 L R V I E A D G I T T 254
 TATGACTTCCCAAGATCTTTGTGGGCAACGATATAGTGTCTCCTCCATGCCAACCGCTGTTGGAACTA CTGTAAGCTGCCCTAAATGTTGCATGAC 1600
 I F V G O R Y S V I L H A N Q P V G N Y 274
 TGTCCATGATTTCTAACCCCGCCAGGGATTCGGGCGCTCCGAAACCGGCTGAGCAATTTCCGCGGTGGGATCGACTCGGCTATTCTCCGTTATGTGTGGCG 1700
 W I R A A P N G V S N F A G G I D S A I L R Y V G A 300
 CCCAGAGAGAGCCCACTAGTGAGGATCTCCATCCGACACACTTCAAGAGCAGGATCTTCAACCGCTGATCCTACCCGCGCGCCAGGCATCCAC 1800
 P E E E P N T S E D T P S D T L Q E Q D L H P L I L P G A P G I H 333
 TCCCGTGGGGCGCGGAGCTTGTCCACACCGTATCAATGGAGTTTGTGAGTGTGGCACTTTTCTGGC CCCCTTATT AATAT AATCTGGT TAGGATGCG 1900
 S R G A A D V V H T V S M E F 348
 GCAAACTTCAATTCCTCTGGATGGCGTGCCCTTCCAGCCGTGGCTGATCTCTTCAAGAAATTTATCTAGCTGACGATTTTGAATGTAGC CCGACCA 2000
 L T I L K C S P T 357
 TGC CGGCTCTTCTGCAATATTTATCGGGAGCGCAGACTGCTAATACCTTCTCCCGGCGGGATCCTTTATCCAAGCGT CGCACAATGACATCGTGGAGCT 2100
 M P V L L Q I L S G A Q T A N T L L P A G S F I Q A S H N D I V E L 391
 CAATTTCCAGCTGTCAAAGTACCGCTGTCCGTTGGACCGTCCCTATCTTCTTCTGCGAGCTGAAATTTACGCTCTTTTAGACATCCAAATCCATCT 2200
 N F P A V N V A A V G G P H P I H L 409
 GTGAGCGCAGCGGGACCTTTGGCTTATGGCATATGACTTATTATTAGGCATGGCCATGCACTCGACGTATACGCTCTGCTGGAACGAACTCCGATAACT 2300
 H G H A F D V I R S A G T N S D N 426
 GGTTCATCCGCTATTCTTCTTCTGACTTCCATAAGATGACGATGGCTCACTATGGTTTTACCCAGCCTCGCAGAGATGTCTATCCACCGGTACCGATC 2400
 W F N P P R R D V V S T G T D 441
 CTAATGACATGTGTACGTTTTCGCTATTGATGTCCGTTTTGATTTGACTGTTGGACGACCACTTCCGTTCCGGG CCGACACCCGTACGTAACCTG 2500
 P N D N V T I R F R A D N P 455
 CTGAATCTCTGCTTGTCTTTGGTTCTCATAATCTCATCAGAGGTCCATGGTTCCTTCACTGCCACATTGACTGGCACCCTGAACTCGGCTTTGCTTTGGT 2600
 G P W F L H C H I D W H L E L G F A L V 475
 GATGTCAGAGCGCCTAGCGAATGGGACAGCGACATTAAACCTCTGGTGGCTGCTGTGAACCTTTCTCCCTACACTTGCTAAGATCGCTCTAGCTG 2700
 I A E A P S E H D S D I N P P A 491
 CCGTGGGATGACCTATGCCCTACGTTGCTTGGCTTCTCTTTTACTATTTCAAGTTTCTTCACTTCTCAACTTCAAGATATGATGCCCTGCCGCTGAG 2800
 A W D D L C P T F A W L L F Y Y F K F P H I L N F T D M M P C R L S 525
 CAGCAGTAATCGATTAAGAACCTCAACGTTGACTAAGGAAAAAGCAAGCAGAATATGAACCTCTCAITTTATCTTATATCGACACATTCACATTTCAA 2900
 S S N R V K N L N V D 536
 CCTACGGATTTTCTCTCGCCTGAATTTCCGTTGCTAGATCCCATCTCTTGGTGGAGTAGGAAAGAAATTTCTTGTATAAACCCATGSGGTTCTTCTACC 3000
 AATATATATATCAAGCTCCGTTGGGTTAGTTAATTCCT 3037

Gène de la laccase d'*Halocyphina villosa*

Figure 12

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